# EPAct and Related Testing Status and Rulemaking Usage

May 27, 2008

# Background: Program, Reason, Usage

- Light Duty Exhaust Fuels (~$4.3M EPA, $3M DOE)
  - Reason: Impact of ETOH and fuel properties on Tier 2 exhaust emissions
  - Usage: MOVES and Complex model, EISA, CMAQ,SPECIATE, PM source app.
    - RFS2 NPRM (freeze data July, 2008) - E10, E15 discussion
    - RFS2 FRM, (1st Q 2009) Extensive E10, E15, E20 data set from Phases 1&2 (partial 3)
- Oil PM Study
  - Reason: Determine oil age and ETOH interaction impact on PM
  - Usage: Support of LDEF and future MOVES PM oil age relationship
    - LDEF vehicle mileage requirements for oil stability
    - Oil change requirements between ETOH blends
- PM Speciation
  - Reason: Impact of ETOH on Tier 2 vehicle PM and VOC speciation profiles, metals
  - Usage: CMAQ and other modeling, source apportionment work
    - RFS2 FRM
- Non-Road Exhaust
  - Reason: Impact of ETOH on sample of non-road engine exhaust
  - Usage: MOVES (general data need) to support:
    - Early data for RFS2 NPRM, RFS2 FRM
- Evaporative Testing
  - Reason: Impact of ETOH on Tier 2 near zero and determine % fleet malfunctioning
  - Usage: MOVES (general data need) and to support:
    - RFS2 FRM
- All data can be used for future GHG rulemaking, EISA Anti-Backsliding report to Congress, & update of Complex Model (2009)

# Light Duty Exhaust Fuels (SWRI)

- Phase 1 - Started (75F with E0, E10, E15) – (4/08 to 6/08)
  - All 19 vehicles aged to 4k on dyno and oil samples taken for analysis
  - E0 fuel testing underway
  - Program issues resulting in delays:
    - Proper blending of fuels (3 of 31 total) has been difficult
    - Fuel supplier trouble blending E10 and E15 at desired distillation distribution (T#s)
      - EPA to specify via refinery industry blending tool
      - Refinery tool requires EPA staff to specify blendstocks portions
      - Due to CBI nature, EPA will handle refinery tool and supplier blendstock data for program
    - Toxics analysis found DNPH contamination – solved but some lost data
    - Tunnel issue finding PM with blanks – solved with cleaning/EPA inspection
    - Flow meter issue – using SAO for second by second data until solved
    - OBD data issue – solved with vehicle communication interface upgrade
- Phase 2 – (50F with E0, E10, E15) – (7/08 to 9/08)
  - Required facility upgrades which are in process
    - Temperature & humidity control units
- Phase 3 - Planned (9/08 to 5/09)
  - Fuel blendstock recipe to be supplied by EPA via Refinery tool
  - Addressing DOE requests (Doug Lawson)
    - Attempting to meet high emitter desires while meeting overall EPA/DOE needs
    - Convinced DOE to run high emitter/high mileage vehicles at end of phase 3

# Fresh Oil PM Study (NVFEL)

- Oil PM stabilization on E0 completed
  - EPAct Phase 1 oil aging(2k) “safe” from fresh oil influences on PM
  - Conclusion: Stabilization occurs much lower mileage (.5k to 1k)
    - Likely oil time at temp relationship
    - Did not isolate to PCV (off-gassing) or cylinder surface (oil shearing)

- Oil PM and ethanol fuels (E10 & E20) completed
  - Oil samples will be analyzed for ethanol content– likely little found
  - Decision will need to be made:
    - IF no PM change E0 to E10 to E20 – no oil changes required for EPAct
    - ELSE (isolate to fuel only or fuel/oil interaction)
      - Go back to E0 to see if reversible then move to E20
        - » If Fuel caused any PM change and not oil related – good news

- Outcome of E0/E10/E20 influence on PM findings:
  - If PM rates are a function of ethanol content (up or down)
  - Dictates if fuels can be randomized in EPAct Phase 3
    - Driver influence on PM
    - Preferred statistical approach
  - Use as comparison to DOE PM findings (Doug Lawson)

# PM Speciation
## (NVFEL/ORD-NRMRL)

- ORD ($700K)
  - NRMRL supplied a proposal that fulfills our data needs including:
    - Low-temperature work
    - NRMRL has EPAct funding for this project that we can leverage
    - Positive results from new research to provide phase-specific SVOC speciation instead of combining sample across phases
  - Vehicle testing: ASD site visit(s) and/or participation to address any potential issues/concerns
  - Analytical capability, especially for SVOCs is state-of–the art
  - Toxics sampling equipment will be supplied for program
- NVFEL ($400K)
  - LOD analytical capabilities and capacity will be determined for subset
  - Vehicle testing: On-site expertise and state-of-the art sample collection capacity
  - On-sight analytical capability for chemical speciation of PM is currently limited
  - Discussion regarding desired E85 testing
  - Cross lab checks planned and explore NVFEL future programs
- Additional funding to expand testing

# Nonroad Exhaust (Intertek Carnot - $800K)

- EPAct E10 fuel (#18) delayed
  - Common with vehicle program
  - Program waiting for fuel before proceeding (baseline emissions needed on #18)
- All engines (12) acquired
  - (4) class I, (4) class II, (4) class IV
- Correlation engine (Environment Canada program)
  - Differences in criteria emissions and PM found
    - Investigating
      - Measurement/sampling method differences
      - Investigating PM filter differences
  - Possibly proceed even with correlation emission differences
    - Lab to Lab normal differences
    - Engine BSFC are much closer indicating load correlation
    - Engines still comply with standards
- Additional nonroad testing program discussions (available funds)
  - Leverage ARB E6, E10 program
  - DOE interested in participating for they now have available funds
  - Target largest emission inventory and more relative to all US
    - Warm weather equipment (motorcycles, boats, ATVs)
    - Cold weather equipment (snowmobiles, snow removal equipment, etc)

# Non-Road Exhaust (SwRi - $500K)

- Coordination with ARB & DoE

# Evaporative Testing

- $1.6 Million + CRC funds
- Program Design for E-77-2 (Current program at ATL)
  - Test Plan, after 4 weeks preconditioning at each ethanol level:
    - Static permeation
    - Running loss
    - Hot soak
    - 72 hour diurnal (65°-105°F)
  - Time Line: Testing to be complete September of 2008
- Program Design for E77-2b (New program at SwRI)
  - *Objective*: Additional, newer technology, high sales volume vehicles to the CRC E-77-2
  - Designated E-77-2b by CRC, EPA is the Lead
  - EPA evaporative emissions experts input to program
  - Plan to repeat E-77-2 program with 8 more vehicles and 1 implanted leak, without E20 fuel (unless added by DOE)
  - Speciation on 100+ VOCs
  - Testing at SwRI, will take ~12 mos. (complete summer of 2009)
  - CRC has offered to supply fuel which was left over from E-74b and E-77-2 programs for continuity
  - CRC has offered to supply 5 vehicles from E-74b program for EPAct related work; all aging enhanced evap will work well here, not appropriate for the LD Gas Fuels program where required newer vehicles. (Pending CRC Board approval)

**E77-2b**
**Vehicles:**
**8 Tier 2/Near Zero**
**1 implanted leak**

**Fuels:**
E0, 7 and 9 psi
E10, 7 and 10 psi
E20, 9 psi (funded by DOE)

# Determine Fraction of High Evap Vehicles in Fleet (ERG – CO/TX)

- *Objective*: Find the percentage of high emitting evaporative emission vehicles in the average fleet of on-road motor vehicle passenger cars and light trucks.
- Pilot Program: propose and refine test procedure
  - 100 vehicles
  - Pre-screen using RSD
  - Evaluate several methods including portable SHED
- Main Program
  - Do measurements on ~1000 vehicles
  - Apply protocols developed in pilot
- ICR
  - Specific to this project
  - Pilot must take place this summer
  - **At OMB for review**
- Collaboration
  - Colorado Department of Public Health and Environment (CDPHE)
    - Offering RSD and technical expertise
    - CRADA in process (Colorado has signed, OGC is reviewing)
  - CRC

# EPAct Testing Budget (millions)

| Testing | 2007 | 2008 | Notes | DoE | CRC |
|---|---|---|---|---|---|
| Fuel Effects Testing | $3.3 (+0.15) | | Pulled ahead funds | $2.0 | Need $0.06 horsetrade |
| PM Speciation NRML | | $0.4 n/a | Data analysis/ testing/ AVL sampler. (ORD + $0.7) | | |
| Evap E772b SwRI | | $0.6 | Evap Testing | $0.10 | Fuels + 5 vehicles |
| Evap E77 3 ERG | $1.0 | | Evap leaker rate, pulled ahead funds | | $0.04 |
| CRC E74 b | | | CO/RVP Effects (E0, | | $0.25 |